

Family name:

Given name:

Student ID:

STA 247 — Quiz #4, 2001-11-11, 3:10pm – 35 minutes long

No books, no notes, and no calculators may be used.

All numerical answers must be actual numbers (decimals such as 0.15 or simple fractions such as $3/13$ or $4/3$), not just a formula. If this requires arithmetic on numbers bigger than 1000, you've either made a mistake, or you should think of an easier way to solve the problem.

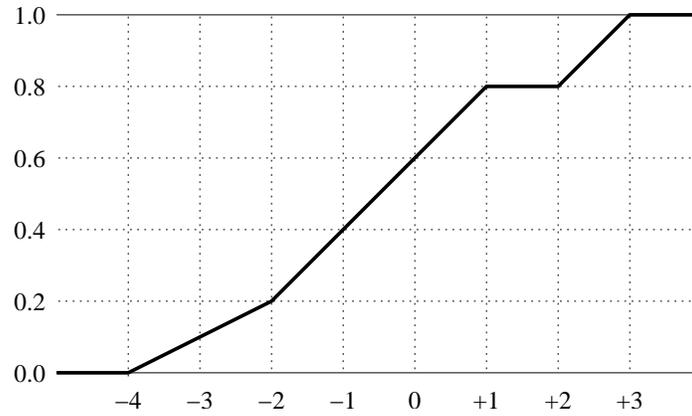
Q1: [45 marks] You are a participant in a game show, where you are shown an urn containing 100 black balls and 200 white balls. The game show host will randomly draw 72 balls from this urn, *replacing each ball before drawing the next*, and will pay you \$1000 if the number of times a black ball is drawn is 30 or less (if not, you get nothing). Find the probability that you will win the \$1000. An good approximate answer is sufficient. Show your work.

You may find the following table of the cumulative distribution function of the standard normal distribution to be helpful:

Table of the CDF for X when $X \sim N(0, 1)$:

x	-3.0	-2.5	-2.0	-1.5	-1.0	-0.5	0.0	+0.5	+1.0	+1.5	+2.0	+2.5	+3.0
$P(X \leq x)$	0.001	0.006	0.023	0.067	0.159	0.309	0.500	0.691	0.841	0.933	0.977	0.994	0.999

Q2: [55 total marks] Here is a plot of the cumulative distribution function for a random variable X :



a) [25 marks] Draw a plot of the probability density function for X .

b) [10 marks] Find the numerical value of $P(-3 < X < 0)$. Explain briefly how you got your answer.

c) [10 marks] Find the numerical value of $E(X)$. Show your work.

d) [10 marks] Define $Y = X/3$. Find the numerical value of the probability density of Y at the point -1 . In other words, find $f_Y(-1)$. Show your work.